

RESEARCH & INNOVATION CENTRE





Incorporating Sustainability and Economic Viability in Horticultural & Compost Research

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Outline

1. Background about Vineland

- 2. Holistic view on soil and tree health
- 3. Nursery case study trial
- 4. Future of farm soil health in Canada



Vineland Research and Innovation Centre

Improving the economic viability, sustainability and competitiveness of horticulture in Canada

- Independent, not-for-profit launched in 2007
- Results-oriented Canadian organization dedicated to horticulture science and innovation
- Deliver products, solutions and services through an integrated and collaborative cross-country network



Research focus

Innovation programs



Biological Crop Protection Consumer, Sensory & Market Insights Crop Enhancement & Adaptation Horticultural Technology Solutions Plant Responses & the Environment

Vineland Research & Innovation Centre Greening the Landscape



Background

What we do





Developing evidence-based practices to support environmental conditions that enable the sustainable growth and use of plants in the landscape

- Conduct comprehensive testing, analysis and reporting on the state of growing media health
- Design and develop best practices, management and monitoring strategies for tree planting, establishment and growth
- Support collaboration and knowledge sharing across the urban tree value chain

Background

Where are trees coming from?

Bare root



Photos courtesy of Glen Lumis

Background

Where are trees coming from



Highly intensive management to produce bare root and B&B trees



Analyzing soil health properties



- Soil organic matter
- Particulate organic matter
- Soil respiration

- Soil texture
- Bulk density
- Macro nutrients
- pH

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 Electrical conductivity Saturated hydraulic conductivity

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Connectivity of soil health parameters



Soil health properties



- Biodiversity ٠
- Pest & disease regulation

- Compaction ٠
- Nutrient cycling ٠
- Sodium
- Cation exchange • capacity
- Carbon storage

- Hydrological
- Drainage ٠
- Water infiltration
- Gas exchange

Soil Organic Carbon Degradation Risk (2016)



Vineland Research & Innovation Centre Greening the Landscape



Nursery compost

Cover crops



Organic amendments



Nursery compost



Top 3 soil management challenges

Nursery challenges

Weed management

Soil compaction

Loss or difficulty building organic matter



State of the Industry Report On Soil Management

Ontario Field Tree Nursery Producers

Top 3 soil management challenges





State of the Industry Report On Soil Management

Ontario Field Tree Nursery Producers

The importance of organic matter in soil

Health forest soil vs. Nursery soil:

- Highly compacted, fine silt and clay soils
- Low amount of organic matter



The importance of organic matter in soil

- Site results:
 - Poor growth
 - Poor survival
 - Low available moisture
 - Soil erosion



Fall 2019

Group	Indicator	Value	Rating
physical	Predicted Available Water Capacity	0.16	67
physical	Surface Hardness	597	1
physical	Subsurface Hardness	625	0
physical	Aggregate Stability	13.4	12
biological	Organic Matter	1.0	10
biological	ACE Soil Protein Index	2.4	7
biological	Soil Respiration	0.2	9
biological	Active Carbon	175	8
chemical	Soil pH	5.8	46
chemical	Extractable Phosphorus	13.9	100
chemical	Extractable Potassium	54.0	79
chemical	Minor Elements Mg: 65.9 / Fe: 5.3 / Mn: 6.1 / Zn: 0.7		100

Farm trial #1



		Fall	2019)	Fall 2020		Farm trial #1	
Group	Indicator	Value	Rating		Value	Rating		
physical	<u>Predicted</u> Available Water Capacity	0.16	67		0.19	79		
physical	Surface Hardness	597	1		124	67		
physical	Subsurface Hardness	625	0		347	33	0.5 inch of "compost" 0.5 inch of manure improved soil within 1 year	
physical	Aggregate Stability	13.4	12		7.1	9		
biological	Organic Matter	1.0	10		1.7	36		
biological	ACE Soil Protein Index	2.4	7		5.50	29		
					0.5	33		
biological	Soil Respiration	0.2	9		463	52		
biological	Active Carbon	175	8		6.9	100		
chemical	Soil pH	5.8	46					
chemical	Extractable Phosphorus	13.9	100		7.7	100		
chemical	Extractable Potassium	54.0	79		37.5	54		
chemical	Minor Elements Mg: 65.9 / Fe: 5.3 / Mn: 6.1 / Zn: 0.7		100			100		

Farm trial #2



August 8 to October 6

Two months to produce mature, high quality compost

Soil health management practices



Clean cultivated

- Improves aeration and physical conditions
- Improves biological activity
- Controls weeds and reduces competition for light, water and nutrients
- Improves infiltration by breaking soil surface crust



Compost

- Provides essential nutrients to roots
- Decreases bulk density and prevents compaction
- Improves water holding capacity
- Provides food for soil microbes

• Provides essential nutrients to roots, helps release calcium

Compost + clover

rye cover crop

- Improves soil structure and prevents compaction
- Provides healthy environment for microbes and mycorrhizal fungi
- Improves water holding capacity

Conclusion

- 1. Compost is essential for improving compacted nursery soils
- 2. It increases organic matter content of degraded soils
- 3. When combined with other BMPs (cover crops), it can build back soil health
- 4. Testing soil before and after amendment application can demonstrate the benefits of these important soil management practices



Soil is essential

Soil ecosystem services



- Water purification and storage
- Climate and flood regulation; nutrient cycling
- Carbon sequestration
- Provision of food, fibre, fuel and construction materials
- Habitat for organisms
- Foundation for human infrastructure and cultural heritage

Senate

CANADA

Sénat

The Standing Senate Committee on Agriculture and Forestry Report: Critical Ground: Why Soil is Essential to Canada's Economic, Environmental, Human, and Social Health (sencanada.ca)



Thank you





















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